REMARKS

I. Application Status

Claims 17-41 are pending in the *Subject Application*. Claims 17, 24, 32, and 33 are independent claims. Claims 1-16 were previously canceled.

Claims 32, 33, and 38-41 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 4,944,985 to Alexander et al. ("*Alexander*").

Claims 17-31 and 34-37 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,059,245 to Phillips et al. ("*Phillips*") in view of *Alexander*.

Applicant respectfully traverses all rejections. Applicant respectfully requests reconsideration, withdrawal of the rejections, and allowance of the *Subject Application*. All references to the "*Specification*" herein refer to the substitute specification filed on April 28, 2004 in the *Subject Application*.

II. Claim Amendments

New claims 42-45 are added herein. Support for the new claims is found in the *Specification* at paragraphs [0036] and [0037]. It is believed that the new claims do not add new matter to the *Subject Application* and are fully compliant with 35 U.S.C. §§ 112 and 132(a).

III. Claim Rejections under 35 U.S.C. § 103(a)

To establish a *prima facie* case of obvious, the cited references must expressly or impliedly teach or suggest the claimed invention, or the Office must present

a rational line of technical reasoning based on factual evidence showing why a person having ordinary skill in the relevant art would have found the claimed invention to have been obvious in view of the teachings of the cited references. *MPEP* §§ 2142 and 706.02(j). Rejections on obviousness grounds cannot be sustained with mere conclusory statements or unsupported assertions. The Office must clearly communicate logical reasoning with rational underpinnings based on a preponderance of factual evidence to support the legal conclusion of obviousness. *See* MPEP § 2142, citing *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

Applicant respectfully submits that *Phillips* and *Alexander*, alone or in combination, do not establish a *prima facie* case of obviousness for the subject claims.

A. Rejection of independent claims 32 and 33 over *Alexander*

As acknowledged in the *Office Action*, *Alexander* teaches core-and-shell type composite particles in which chemically reducible metals (*i.e.*, via oxidation-reduction (redox) reactions) are plated onto the surface of an inert core particle to form a metal shell surrounding the core particle. *Alexander* at c. 3, l. 64 – c. 4, l. 19. In certain embodiments described in *Alexander*, the core-and-shell particles may consist of a metal core coated with a different metal layer. *See, e.g., id.* at c. 13, ll. 41-47. However, *Alexander* does not teach or suggest any embodiments comprising particles consisting of a single metal. All of the particle embodiments taught in *Alexander* consist of two or more different metals or other materials. *Id*. at c. 12, l. 10 – c. 13, l. 62.

In contrast, the nanofillers recited in independent claims 32 and 33 consist of a single metal, *i.e.*, copper, silver, gold, palladium, or platinum. While the claimed screen printable formulations may include two or more types of metallic nanofillers (for example, a mixture of copper nanofillers and silver nanofillers), the recited nanofillers themselves consist of a single specified metal, and do not comprise a combination of metals like the particles taught in *Alexander*.

Independent claim 32 recites "nanofillers consisting of copper."[1] Independent claim 33 recites "nanofillers selected from the group consisting of copper nanofillers, silver nanofillers, gold nanofillers, palladium nanofillers, platinum nanofillers, and combinations thereof."[2] The nanofillers recited in independent claims 32 and 33 exclude elements other than the specified metals and impurities ordinarily associated therewith. *MPEP* § 2111.03. *Alexander* does not teach or suggest such nanofillers because *Alexander* **only** describes composite particles comprising at least two different materials. Consequently, *Alexander* does not establish a *prima facie* case of obviousness for independent claim 32 and 33. Therefore, Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. § 103(a) of claims 32 and 33 and their dependent claims.

B. Rejection of independent claims 17 and 24 over *Phillips* in view of *Alexander*

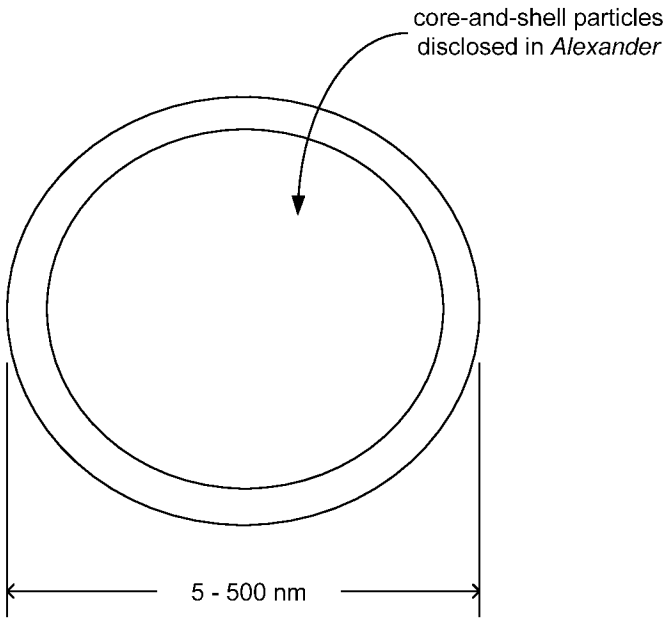
The rejection of independent claims 17 and 24 is based on the combined teachings of *Phillips* and *Alexander*. Applicant acknowledges that obviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. *See MPEP § 2143.01*. In the present case, however, a person having ordinary skill in the art would **not** combine the teachings of *Phillips* and *Alexander* in the manner asserted by the Office because the references mutually teach away from their combination.

As noted above, *Alexander* teaches core-and-shell type composite

[1] Please note that the recitation of "nanofillers consisting of copper" does not exclude the inclusion of other particles to the recited compositions in addition to the recited particles. Rather, this recitation requires the inclusion of nanofillers that consist of copper in addition to any other optional particles that may be included by virtue of the "comprising" transitional phrases in the preambles. Further, the "consisting of" transitional phrase does not exclude impurities ordinarily associated with copper. *See MPEP* § 2111.03.

[2] Please note that the "combinations thereof" language in claim 33 refers to mixtures of different nanofiller particles, not combinations of different metals comprising a single type of nanofiller particle.

particles comprising metals plated onto the surface of core particles. The particles may have a particle size ranging from 5 to 500 nanometers. *Alexander* at c. 12, ll. 21-53. These dimensions are illustrated in the schematic provided below.



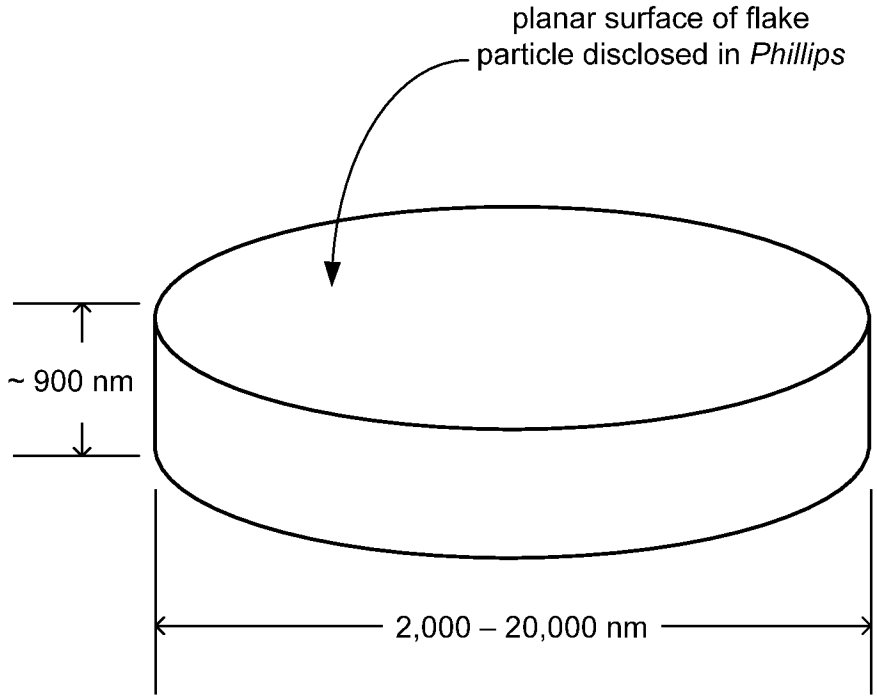
Alexander teaches that these composite particles are designed to be added to molten metals and cast into solid metal or alloy materials comprising the core particles dispersed throughout a solid metal or alloy matrix. *Id.* at c. 14, l. 30 – c. 15, l. 61; c. 16, ll. 30-66. *Alexander* also teaches that the composite particles can be added to ink formulations to make conductive metallic inks. *Id.* at c. 13, ll. 41-47; c. 15, l. 62 – c. 16, l. 16.

Phillips teaches optically variable flakes that are designed to be added to ink and paint formulations as pigments to make optically variable inks and paints, *i.e.*, providing a color shift between two distinct colors at first and second angles of incident light. *Phillips* at abstract. The optically variable flakes consist of a multi-layer thin film interference structure having first and second parallel planar surfaces on either side of the flake. The flakes also have physical dimensions such that when the flakes are measured in directions parallel and perpendicular, respectively, to the planar surfaces an aspect ratio of at least 2:1 is provided. *Id.* In other words, the ratio of the planar

length of the flakes to the thickness of the flakes is at least 2. *Id*. at c. 16, ll. 3-15.

The optically variable flakes comprise multiple layers of different materials such as dielectric layers, cermet layers, and metal layers. *Id.* at c. 7, l. 52 – c. 10, l. 32. The multi-layer construction of the flakes is illustrated in Figures 3A-3E, in which the constitutive layers are stacked through the thickness of the respective flake particles. As shown in Figures 3A-3E, the layers comprising the flakes are required to have a symmetrical orientation through the thickness of the flakes so that optical performance of the flakes is the same for radiation incident on either of the opposed parallel planar surfaces of the flakes. *Id.* at c. 2, ll. 39-52. In this regard, *Phillips* states that "[i]t is important that the optical variable device be symmetrical so that no matter which side the flake lands on, it still will give a color shift." *Id* at c. 15, l. 68 – c. 16, l. 3. This critical positioning of the flakes in an applied ink or paint film is shown in Figure 1C.

The optically variable flakes disclosed in *Phillips* have a thickness of approximately 0.9 microns (900 nanometers) and a planar length dimension ranging from 2 to 20 microns (2,000 to 20,000 nanometers). These dimensions are illustrated in the schematic provided below.



The Office asserts that a person having ordinary skill in the art would be motivated to modify the ink composition disclosed in *Phillips* by substituting the core-and-shell type composite particles disclosed in *Alexander* for the optically variable flake particles disclosed in *Phillips*. *Office Action* at pp. 7-8 and 11. The Office attempts to support this assertion by stating that a person having ordinary skill in the art "would appreciate the substitution would not alter the resultant optically variable ink of Phillips taught therein and likely achieve with a reasonable expectation of success the optically variable ink." *Id.* at pp. 8 and 11.

Applicants respectfully disagree with the Office's reasoning because *Phillips* and *Alexander* present mutually inconsistent teachings with respect to ink formulations comprising the respective particles. As such, a person having ordinary skill in the art would be directed away from combining the reference teachings.

In this regard, it is important to note that *Alexander* emphasizes the importance of spherical-shaped particles (*i.e.*, having an aspect ratio of 1) throughout the disclosure. Indeed, the only mention of non-spherical particles in *Alexander* occurs at column 13, lines 36-40, which states that:

> For dispersion hardening it is preferred to use spherical or cubic particles which are dense, discrete and anhydrous. For stiffness or other special effects fibrous or platelike particles can be used.

This disclosure is presented in *Alexander* in the context of particle-filled metals or alloys, *i.e.*, metals or alloys comprising the core particles dispersed throughout a solid metal or alloy matrix, which has absolutely no relevance to ink or paint formulations, as disclosed in *Phillips*.

More importantly, however, *Alexander* does, in fact, address the use of the disclosed core-and-shell particles in ink formulations. In this relevant context, *Alexander* teaches that "inks **require** discrete, constant sized and substantially **spherical** particles in order to achieve good performance." *Alexander* at c. 15, ll. 65-67 (emphases added). In direct contrast, *Phillips* teaches that the disclosed inks require plate-like flake particles in order to achieve the intended purpose of providing a color

shifting optically variable ink:

> The aspect ratio [***i.e.*, length/thickness ≥ 2**] is important in that it helps to ensure that the flakes will land either on their top and bottom sides and not on their ends. It can be appreciated if the flakes fall on their ends, that there would be no color shift from the flake. It is important that the optical variable device be symmetrical so that no matter which side the flake lands on, it still will give a color shift. In other words, the color will be maintained. Thus it certainly is desirable not to have a one-to-one aspect ratio [***i.e.*, a substantially spherical particle**] but rather be at least two-to-one or three-to-one. Since the total thickness of the optically variable thin film is approximately 0.9 microns, the 2 micron dimension is approximately **the smallest dimension** desired for the flakes. By utilizing an aspect ratio of at least 2 to 1 and greater, preferably 5-10, to 1, gives assurance that a major proportion of the flakes will land in the ink vehicle with an orientation such that the surfaces providing the color of the flakes will be facing upwardly since the thin film coating is symmetrical and those surfaces have the larger dimensions.

Phillips at c. 15, l. 64 – c. 16, l. 15 (annotations and emphasis added).

Thus, in the context of ink formulations, *Phillips* teaches away from spherical particles and toward plate-like particles, whereas *Alexander* teaches away from plate-like particles and toward spherical particles. These diametrically opposed teachings would direct a person having ordinary skill in the art away from the Office's asserted combination.

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art. *MPEP* § 2143.01.III. Indeed, the prior art can be modified or combined to reject claims as *prima facie* obvious only as long as there is a reasonable expectation of success. *Id.* at § 2143.02.I. Here, a person having ordinary skill in the art would **not** have a reasonable expectation of success because the conflicting teachings in *Phillips* and *Alexander* destroy any potential predictability of the asserted combination.

Moreover, as stated in MPEP § 2143.01.V-VI, if a proposed modification would render a prior art invention being modified unsatisfactory for its intended purpose, or change the invention's principle of operation, then the teachings of the cited references are not sufficient to establish a *prima facie* case of obviousness. Here, modifying the ink formulation disclosed in *Phillips* to incorporate the spherical particles

disclosed in *Alexander* would render the resulting modified invention inoperable for its intended purpose because the particles would lack the necessary morphology to function in the required manner described in *Phillips* at column 15, line 64 to column 16, line 15. At the very least, this modification would significantly change in the basic principle under which the *Phillips* ink was designed to operate because of the significantly different particle morphologies.

Furthermore, Phillips expressly teaches that a 0.9 micron thickness (900 nanometers) and a 2 micron planar dimension (2,000 nanometers) are the "smallest dimension desired for the flakes." *Phillips* at c. 16, ll. 7-9. This teaches away from substituting nanoparticles having domain sizes of less than 100 nanometers.

The *Office Action* further asserts that both *Phillips* and *Alexander* recognize that the size of metallic flakes helps provide improved dispersion in a paint, paste, or ink. *Office Action* at pp. 7 and 11. Applicant respectfully submits that this is a significant misinterpretation of the teachings of both references, but especially *Phillips*, which teaches specific flake dimensions in order to achieve specific optical properties. *Phillips* at c. 16, ll. 7-9. In fact, the disclosure of 0.65 micron particles (650 nanometers) in *Phillips*, cited to in the *Office Action*, relates to 650 nanometer alumina (Al_2O_3) particles, not the multi-layer optically variable flakes. *Id.* at c. 14, ll. 20-36.

Notwithstanding the above-described teachings, the *Office Action* asserts that a person having ordinary skill in the art would have appreciated that the Office's asserted substitution would "not alter the resultant optically variable ink of Phillips…." *Office Action* at pp. 8 and 11. This statement is a mere conclusory statement and an unsupported assertion that does not articulate logical reasoning with rational underpinnings based on a preponderance of factual evidence to support a legal conclusion of obviousness. *See MPEP* § 2142. The Office provides no evidence that supports the assertion that the respective particles disclosed in the cited references are interchangeable in an operable manner. Indeed, given the inconsistent teachings in the respective references, operable interchangeability of the particles is highly unlikely to be true. Nevertheless, the burden is on the Office to provide factual evidence that supports

the technical assertions presented in an Office action. Otherwise, a claim rejection under 35 U.S.C. § 103(a) would be based on speculation, which is impermissible. *See KSR*, 550 U.S. at 418; *MPEP* § 2142.

Consequently, the combination of *Phillips* and *Alexander* does not establish a *prima facie* case of obviousness for the subject claims. Therefore, Applicant respectfully requests withdrawal of the rejections under 35 U.S.C. § 103(a).

VI. New Claims 42-45

New claims 42-45 recite "wherein the coating layer on the nanofillers comprises a polymer different than the polymer comprising the matrix." The combination of *Phillips* and *Alexander* does not teach or suggest a polymer coating on a particle that is different than the resin or matrix polymers comprising the disclosed ink formulations. Consequently, new claims 42-45 are independently patentable over *Phillips* and *Alexander*, whether considered alone or in combination.

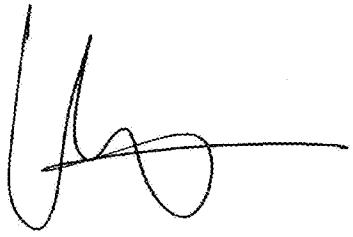
V. Conclusion

The claims of the *Subject Application* are believed to be in condition for allowance. Applicant respectfully requests favorable reconsideration and allowance of the *Subject Application*.

This Response should not be taken as acquiescence to any of the specific rejections, assertions, statements, and the like, presented in the *Office Action* that are has not explicitly addressed herein. Applicant reserves the right to specifically address all such rejections, assertions, and statements in continuing applications, subsequent responses, and/or appeal or pre-appeal proceedings.

If the undersigned can be of assistance to the Examiner in addressing any additional issues to advance the application to a condition of allowance, please contact the undersigned at the number set forth below.

Respectfully submitted,



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